

5.1 Linear Transformations

36, 38

5.1.36 $T(x, y) = (x + ay, x - ay, y)$

$$\vec{x} = \begin{bmatrix} 1 \\ 0 \end{bmatrix} \quad \vec{y} = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \quad [T(\vec{x}), T(\vec{y})] = \begin{bmatrix} 1 & a \\ 1 & -a \\ 0 & 1 \end{bmatrix} \vec{v}$$

$$A = \begin{bmatrix} 1 & a \\ 1 & -a \\ 0 & 1 \end{bmatrix}$$

$$\vec{v}_1 = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} \quad \vec{v}_2 = \begin{bmatrix} a \\ -a \\ 1 \end{bmatrix}$$

5.1.38 $T(v_1, v_2, v_3) = v_1 + v_3$

$$\vec{x} = \begin{bmatrix} a \\ 0 \\ 0 \end{bmatrix} \quad \vec{y} = \begin{bmatrix} 0 \\ b \\ 0 \end{bmatrix} \quad \vec{z} = \begin{bmatrix} 0 \\ 0 \\ c \end{bmatrix}$$

$$A = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$$

$$[T(\vec{x}), T(\vec{y}), T(\vec{z})] = \begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix} \vec{v}$$

$$\vec{v}_1 = \begin{bmatrix} a \\ 0 \\ 0 \end{bmatrix} \quad \vec{v}_2 = \begin{bmatrix} 0 \\ b \\ 0 \end{bmatrix} \quad \vec{v}_3 = \begin{bmatrix} 0 \\ 0 \\ c \end{bmatrix} \quad \vec{v}_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \quad \vec{v}_3 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

$$a=1 \\ c=1$$

$$\vec{v}_2 = 0 \quad \therefore 0 = \begin{bmatrix} 0 \\ b \\ 0 \end{bmatrix} \\ b=0$$

$$\vec{v}_1 + \vec{v}_3 = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} [v_1, v_2, v_3]$$